

Paraquat poisoning: Death after oral intake

Sudhanshu Bansal*, Abhishek Kumar Gangwar, Sofia Thomas

Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab-142001, India.

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ABSTRACT

This case study describes an Indian male patient's death caused by paraquat after oral consumption. A 20-year-old male patient attended the emergency department. He had a major complaint of stomach disorders, vomiting, fatigue, and hypothermia. It was confirmed that he was transferred from a nearby hospital after evaluating the situation. It was reported that paraquat poison had a systemic effect, and during the healing process, he was subject to multiple dialysis. This study will help doctors and clinicians to respond quickly to paraquat poisoning and aid in the early recovery and maintenance of poisoning.

Introduction

Paraquat is a poisonous herbicide that comes in a liquid form with a green tint and a strong odour that must be diluted before application. Paraquat herbicidal properties were first discovered in 1950, and it became commercially available in 1962. Paraquat is the second most commonly used weed killer in the market, with a high risk of side effects. In comparison to unintended consumption, most poisoning cases occur in adults due to suicide attempts. Pulmonary edema, convulsions, heart failure, renal failure, and hepatic failure are the most

frequent side effects of paraquat poisoning (1). The most frequent form of poisoning is oral consumption of paraquat. Death can result from lung injury or multiple organ failure. For diagnosis urine and plasma toxicity tests must be obtained. Hemoperfusion is the safest treatment in the early paraquat poisoning stages (2).

Paraquat poisoning can be classified into three categories-

1. Moderate poisoning:- 20 mg paraquat ion per kg body weight) In which gastrointestinal effects are usually mild.
2. Extreme poisoning:- 20-40mg paraquat ion per kg of body weight) Patients with acute renal failure are said to be in this group. Acute lung injury and pulmonary fibrosis can occur concurrently. Death is estimated in 2 weeks.
3. Fulminant poisoning:- more than 40mg paraquat ion per kg body weight) multiple organ failure leading to death within a few hours or days (3).

*Address for correspondence

Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab-142001, India.

Email: sudhanshu.bansal98@gmail.com

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Case presentation

A 20-year-old patient was admitted into the emergency ward of Medanta S.N. Super speciality hospital with the symptoms of gastrointestinal disturbances, vomiting, and hypothermia with a history of poison intake. He was referred from the civil hospital Abohar Punjab, where he was diagnosed with poisoning a substance used as herbicide (paraquat). There was no previous history of convulsions, ENT bleeds, or loss of consciousness. The vital signs of the patient were recorded from day first to till death indicated in **Table 1**. On the other hand, systemic examination like the respiratory system was clear and cardiovascular system normal S1S2 with no murmur sound. In central nervous system GCS 15/15, pupils bilaterally equally responding to light, soft and non-tender abdomen, his lips, nails, and fingertips were turned blue, and other observations can be seen in **Table 2**. In a previous hospital, he obtained gastric lavage and KMnO₄. During dialysis on the same day, he was hemodynamically and neurologically stable. He was also given the antioxidant N-acetyl cysteine and other supportive medications. Metabolic acidosis with hyperlactatemia was discovered during the investigation. The next day, the patient began to experience hypotension and oliguria. Due to worsening hemodynamic, he was intubated and put on mechanical ventilatory support. Another hemodialysis session was completed on the next day of admission. The patient had chronic hypotension, and he went into cardiac arrest at about 12:30 a.m. on the fourth day of admission. Cardiopulmonary resuscitation (CPR) was conducted and as per the Advanced Cardiac Life Support (ACLS) protocol; however, it was unable to resuscitate and declared dead.

Investigations

Paraquat poisoning was diagnosed, but no other abnormalities or deformities were discovered. His blood glucose and thyroid hormone levels were not predicted on the test. Another investigation, such as urine and chest x-ray, was considered fine. His family denied other examinations due to a lack of time and resources.

Treatment

There are currently no universally accepted treatment recommendations for paraquat poisoning. Mainly prevention of gastrointestinal absorption and increased elimination of paraquat from the blood, and alternative therapies such as immunotherapy and antioxidants are all options for

treating paraquat ingestion. The strategies of prevention were as follow-

Prevent gastrointestinal absorption

Treatment with cathartics, activated charcoal, diatomaceous earths, and gastric lavage should be considered as an intervention in patients who present soon after ingestion to prevent absorption from the gastrointestinal tract. Gastric lavage accompanied by a dose of activated charcoal is the most common treatment, despite the evidence for the benefits of gastric lavage and charcoal being weak, with most research finding little benefit. Treatments to minimize paraquat absorption should be determined on a case-by-case basis, taking into account the possible amount of paraquat consumed as well as the time after ingestion. Early gastric lavage and charcoal treatment could have resulted in overall decreased plasma paraquat absorption and a better clinical outcome in our patients, but this is unclear.

Elimination of poison from the blood

Hemoperfusion (HP), Haemodialysis (HD), and Continuous Venovenous Hemofiltration (CVVH) can all be used to extract paraquat from the blood. It has been suggested that hemoperfusion, rather than hemodialysis, is a better way to extract paraquat from the blood. Using hemoperfusion within 12 hours of poisoning can reduce mortality. CVVH can improve survival, reduce the rate of organ dysfunction, and enable patients to receive additional treatments for a longer period of time. However, successful results were not consistently observed elsewhere whether hemodialysis or hemoperfusion is used alone or in combination. Despite this debate, it is prudent to begin an early trial of hemodialysis or hemoperfusion for 4 to 6 hours daily, understanding that care will be needed for at least 2 to 3 weeks, if available and after determining the likely amount of paraquat ingested.

A variety of alternative therapies

Several other treatments have been introduced for acute paraquat poisoning, including the use of the immuno-suppressant and antioxidant. The percentage of patients who received immune suppressant action (Cyclophosphamide, Metaphosphate, Vitamin E, and Vitamin C) had higher survival rates as compared to those who received it alone Without limiting the amount of oxygen. High concentrations of paraquat may further damage the body organism and lead to oxygen free radical species production. Although

Table 1. Vitals of patient from day of admission till death.

Day	Vitals			
	Blood pressure(mmHg)	Pulse rate(beats/minute)	Respiratory rate(breath/minute)	Spo ₂
First Day	78/44	40	20	96%
Second Day	75/44	48	20	90%
Third Day	70/39	36	18	84%
Fourth Day	67/35	30	12	79%

Table 2. Laboratory observations.

Parameter	Observed Value				Normal Range
	First Day	Second Day	Third-Day	Fourth Day	
Hemoglobin(male)	10.6 g.dL	9.9 g.dL	9.1g.dL	9.1 g.dL	14-18g/dL
Red blood cells	2.18	2.0	2.1	2.1	4.7-6.1cells/mcL
Total Leukocyte count	13.26	18.26	19.86	19.86	4.5-11.0 x10 ⁹ /L
Neutrophils	94.8%	79.6%	78.6%	79.0%	45-75%
Platelets	75000	72600	70300	68000	1.5-4.0 Lakh/cumm
Blood Urea	272.5mg/dL	288.5mg/dL	287.5mg/dL	298.5mg/dL	15-45mg/dL
Sr Uric Acid	4.5	4.0	4.2	4.2	2.4-7.0mg/dL
SGOT	82.7	79.7	79.9	79.0	5-40unit/liter
SGPT	115.1	122.3	132.3	133.9	7-56unit/liter
Bilirubin Total	1.32	1.82	1.99	1.99	0.3-1.2mg/dL
Haematocrit(male)	37.9	36.6	34.6	30.2	41-50%

Table 3. Treatment chat of patient.

Date	Brand Name	Generic Name	Route of Administration	Frequency	Dose
18-9-2020 To 20-9-2020	Inj Dalacin	Clindamycin	IV/IM	TDS	600mg
	Inj Meromac	Meropenem	IV/IM	TDS	500mg
	Inj Pantocid	Pantaprazole sodium	IV/IM	BDS	40mg
	Inj Emset	Ondansetron	IV/IM	TDS	4mg
	Inj Calcium Gluconate	Calcium Gluconate	IV/IM	TDS	100mg/ml
	Inj KCL	Potassium Chloride	IV/IM	STAT	20meq
	Inj Dexona	Dexamethasone	IV/IM	TDS	8mg

the effectiveness of immunosuppressant therapy has been disputed. As for some, but not all anti-inflammatory medications prevent the development of oxygen-radical. The mechanism by which this occurs is unclear. However, this decrease in anti-radical agent production may increase paraquat absorption. There is insufficient data to support the use of Vitamin C or any other antioxidants such as deferoxamine (4). Treatment chart can be seen in **Table 3**.

Outcome and follow-up

Paraquat poisoning is an uncommon but deadly clinical manifestation. There are currently no universally accepted recommendations for treating paraquat poisoning patients. Although there is little evidence for successful treatment of paraquat toxicity, early treatment with gastric lavage, charcoal, or diatomaceous earths may be beneficial in reducing absorption. Hemoperfusion, hemodialysis can be used to reduce paraquat levels in the blood after they have been absorbed. Immunosuppressant and antioxidant therapies are two alternative therapies that may be used in the treatment of paraquat poisoning. The patient in our case was not able to achieve a better result. Vomiting and early gastric lavage/charcoal can reduce paraquat absorption.

Discussion

Vomiting was the most common symptom, followed by changes in sensorium, oral ulceration, dyspnea, and loose stools. Paraquat has renal and hepatic effects throughout the body. Failure, pulmonary edema and fibrosis, cardiac failure, shock, convulsions, and multi-organ failure are just some of the conditions that can occur.

Learning points/take-home messages

- The most common cause of death was a delay in admission to the hospital. Due to a lack of a complete medical history and the lack of diagnostic tests,
- Diagnosis may be difficult. In the previous hospital, the patient had already gone through various treatment protocols.
- The patient in this situation was going from hemodialysis daily, but due to multiple organ failures, we were unable to save him from this lethal poison.
- Finally, it is recommended that make every effort to get to the hospital as soon as possible.

Patient's perspective and consent

Not Applicable as the patient is dead

Contribution of authors

SB: Data collection, and SB, ST, and AKG: Major contributor in writing and drafting the manuscript.

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Conflicts of interests

The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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